Abstract Submitted
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**Laminar-Turbulent Transition: A Hysteresis Curve of Two Critical Reynolds Numbers in Pipe Flow** HIDESADA KANDA, University of Aizu — A laminar-turbulent transition model (DFD 2004) has been constructed for pipe flows: (1) Natural transition occurs in the entrance region, and (2) Entrance shape determines a critical Reynolds number Rc. To verify the model, we have carried out experiments similar to Reynolds's color-dye experiment with 5 bellmouth entrances and a straight pipe. Then, we observed the following: (i) two different types of Rc exist, Rc1 from laminar to turbulent and Rc2 from turbulent to laminar, and (ii) the ratio of bellmouth diameter BD to pipe diameter D affects the values of Rc1 and Rc2. For each entrance, Rc1 has a maximum value Rc1(max) and Rc2 has a minimum value Rc2(min). When overlapping the two curves of Rc1(max) and Rc2(min) against BD/D, a hysteresis curve is confirmed. All Rc values exist inside this hysteresis curve. Consequently, Rc takes a minimum value Rc(min) of approximately 2000 when BD/D is at a minimum, i.e., at BD/D = 1, Rc(min) = Rc1(max) = Rc2(min) = 2000. Regarding Reynolds's Rc of 12,830, we observed Rc1(max) of approximately 13,000 at BD/D above 1.54. Therefore, the model has been partly verified.

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